One Day of CERES TRMM ERBE-like SW Data

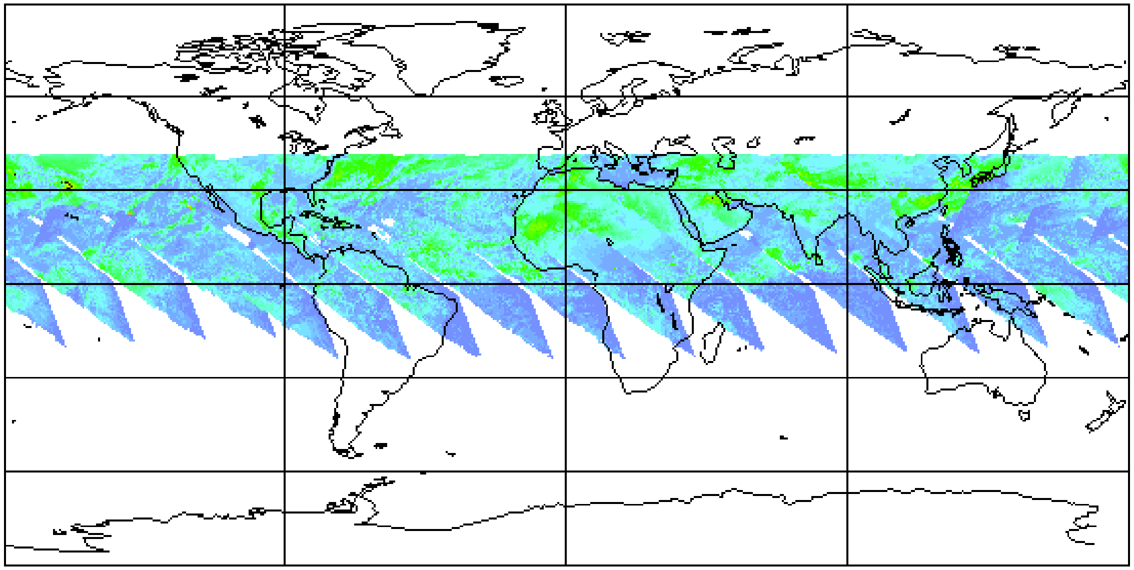

Figure 1. One day of CERES SW radiance

The TRMM orbits are Separated by 1520 km at the Equator. CERES processing returns fluxes for all CERES footprints with viewing zenith angles (VZA) < 70°, which results in a swath width of 1560 km in crosstrack mode. Therefore, CERES orbital swaths overlap, which provides at least two observations of each region per day. The VIRS instrument views to VZA < 48°, which reduces the swath width to 710 km. VIRS data from consecutive orbits do not overlap, which causes gaps in the temporal sampling.

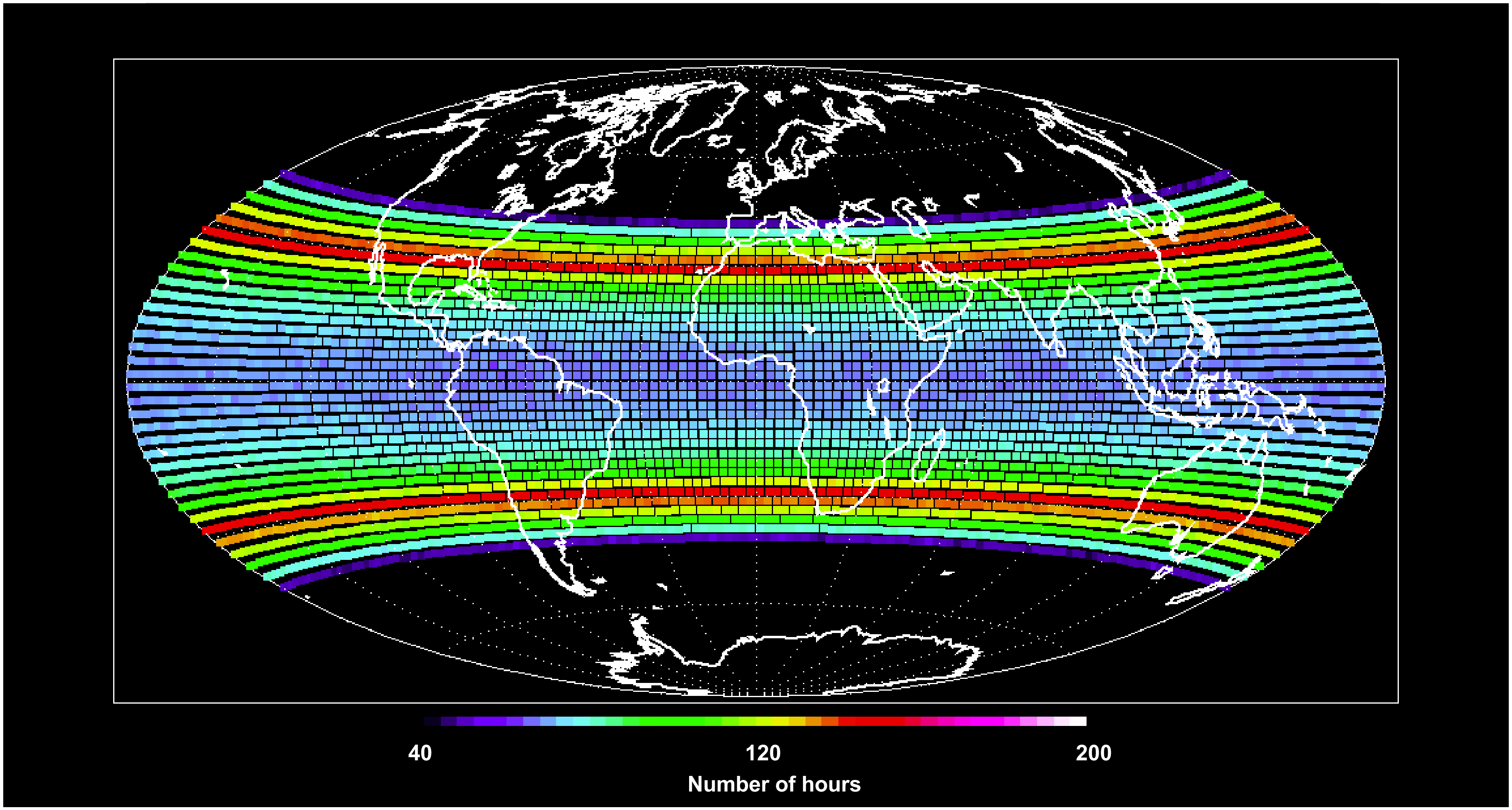

Figure 2. ERBE-like LW sampling.

This figure shows the number of hours during February 1998 that at least 1 LW observation was made in each 2.5° region by the CERES TRMM instrument. ERBE-like processing uses all CERES data out to 70° viewing zenith angle. This results in overlapping swaths from consecutive orbits. Generally, there are 2 LW observations / day near the equator. Greater overlap between orbits at higher latitudes results in the maxima seen near 30° N and 30° S.

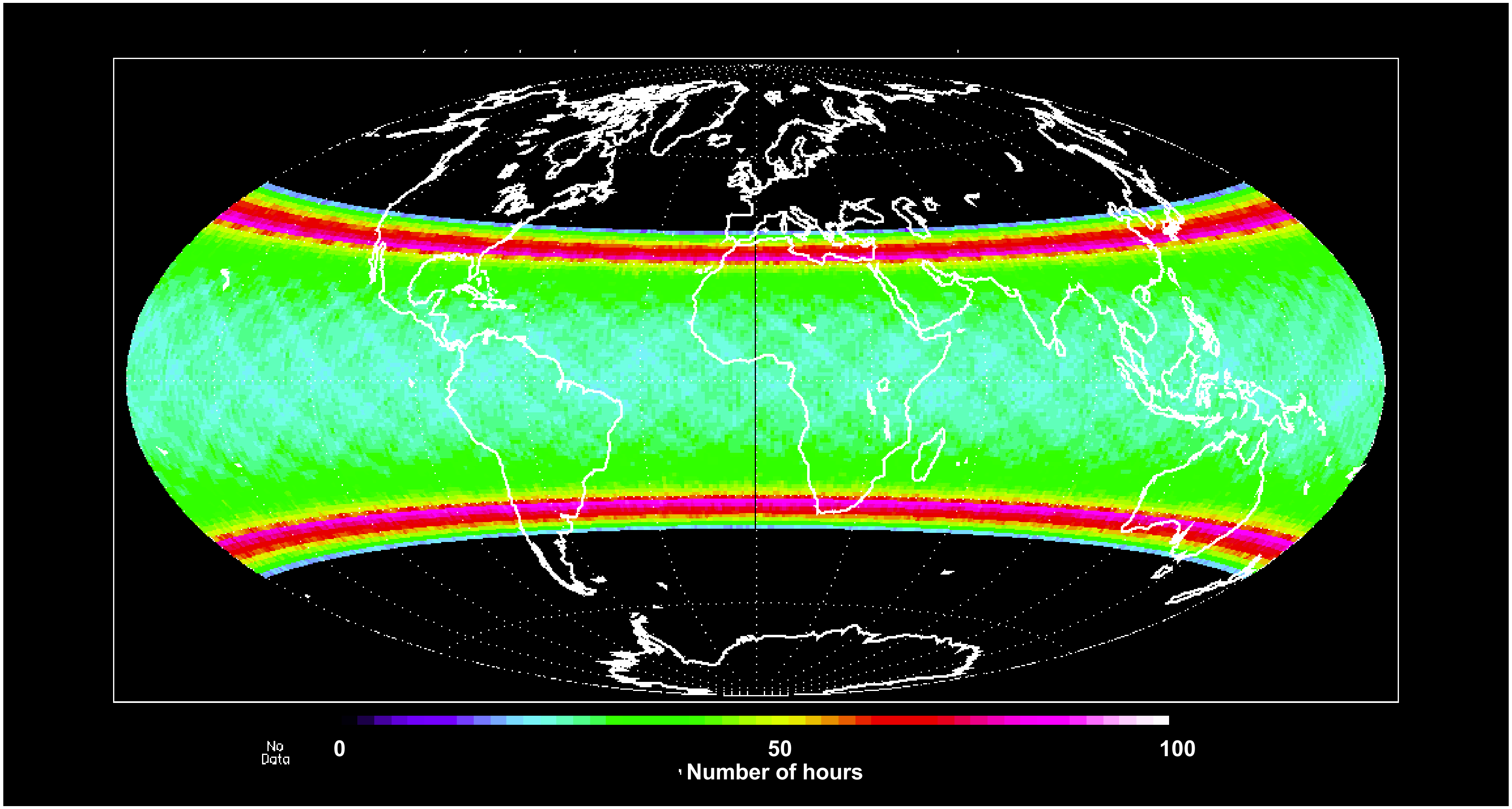

Figure 3. SRBAVG LW sampling.

This figure shows the number of hours during February 1998 that at least 1 LW observation was made in each 1° region by the CERES TRMM instrument. The 48° viewing zenith angle limit to the VIRS instrument results in much less overlap than in the ERBE-like processing (see Fig 2).

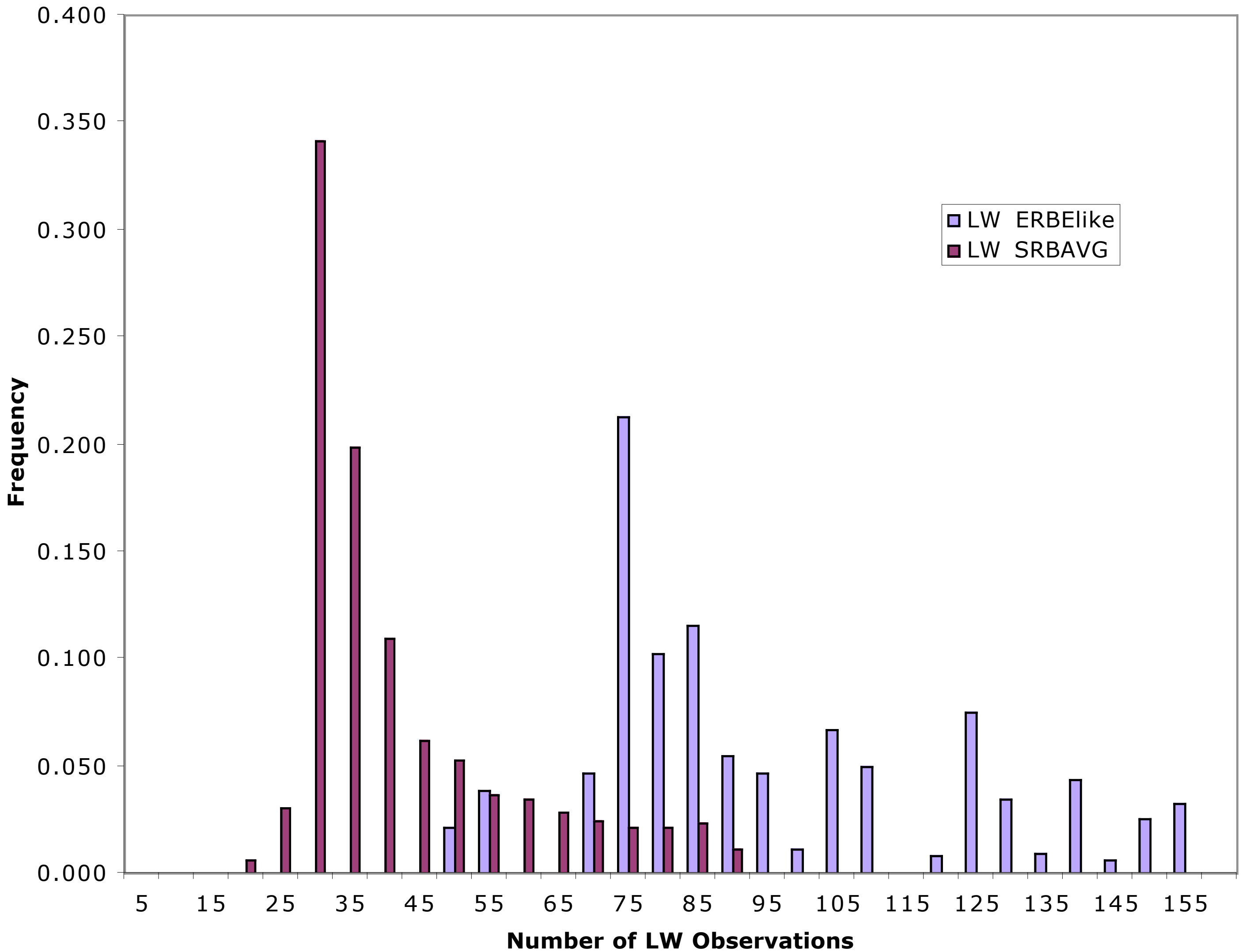

Figure 4. LW Sampling Comparison

Comparison of LW sampling frequency for the ERBE-like and SRBAVG products (February 1998). The viewing zenith angle limitation of VIRS reduces the mean number of hours of LW observations from 93 for ERBE-like to 39 for SRBAVG.

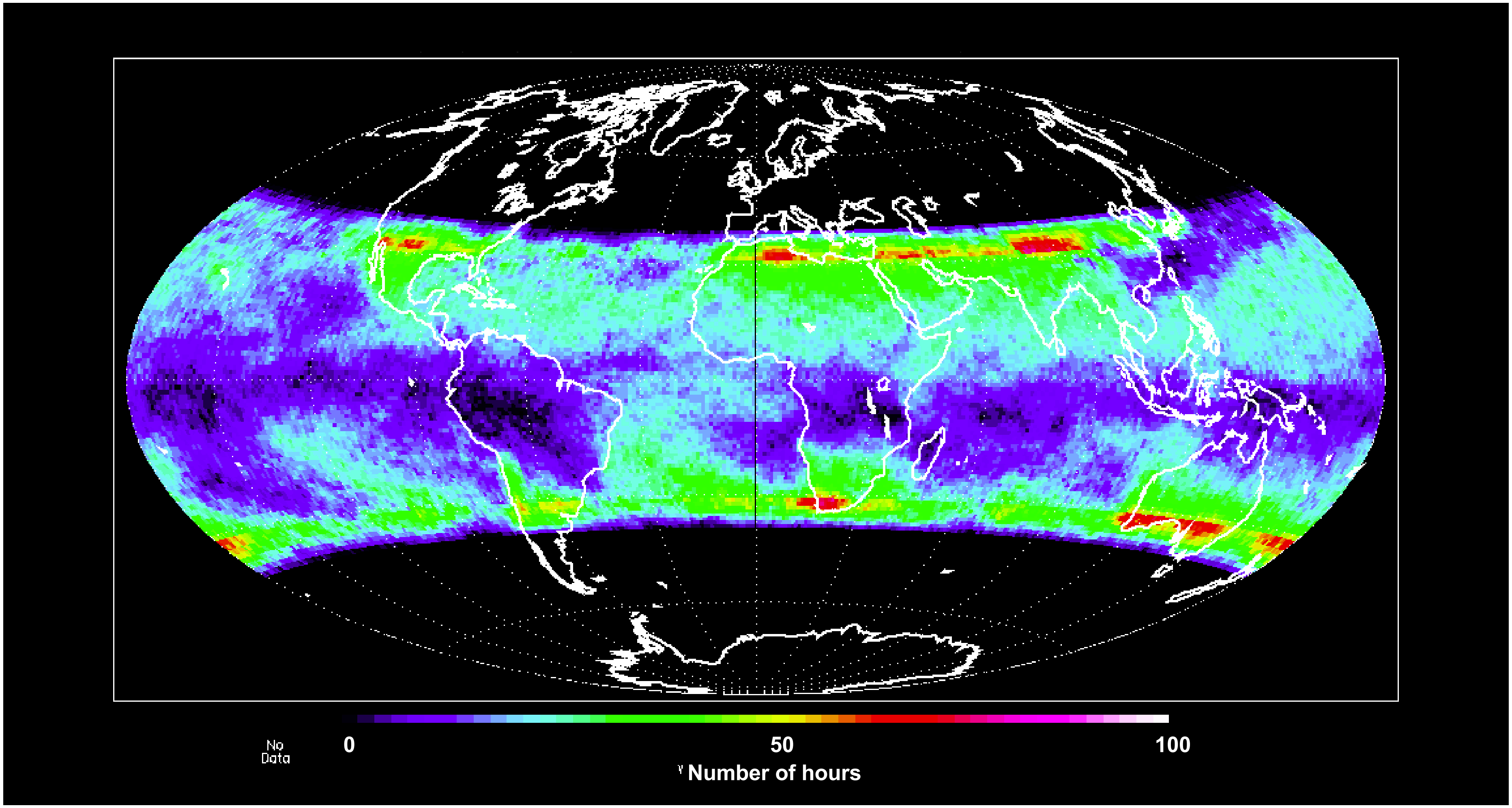

Figure 5. SRBAVG LW clear-sky sampling.

This figure shows the number of hours during February 1998 that at least 1 clear-sky LW observation was made in each 1° region by the CERES TRMM instrument. Areas shaded in black have no clear observations during the month. These are areas predominated by convection. The maxima near 30°N is due to the overall increased SW sampling in the Northern Hemisphere coupled with the proximity to desert regions.

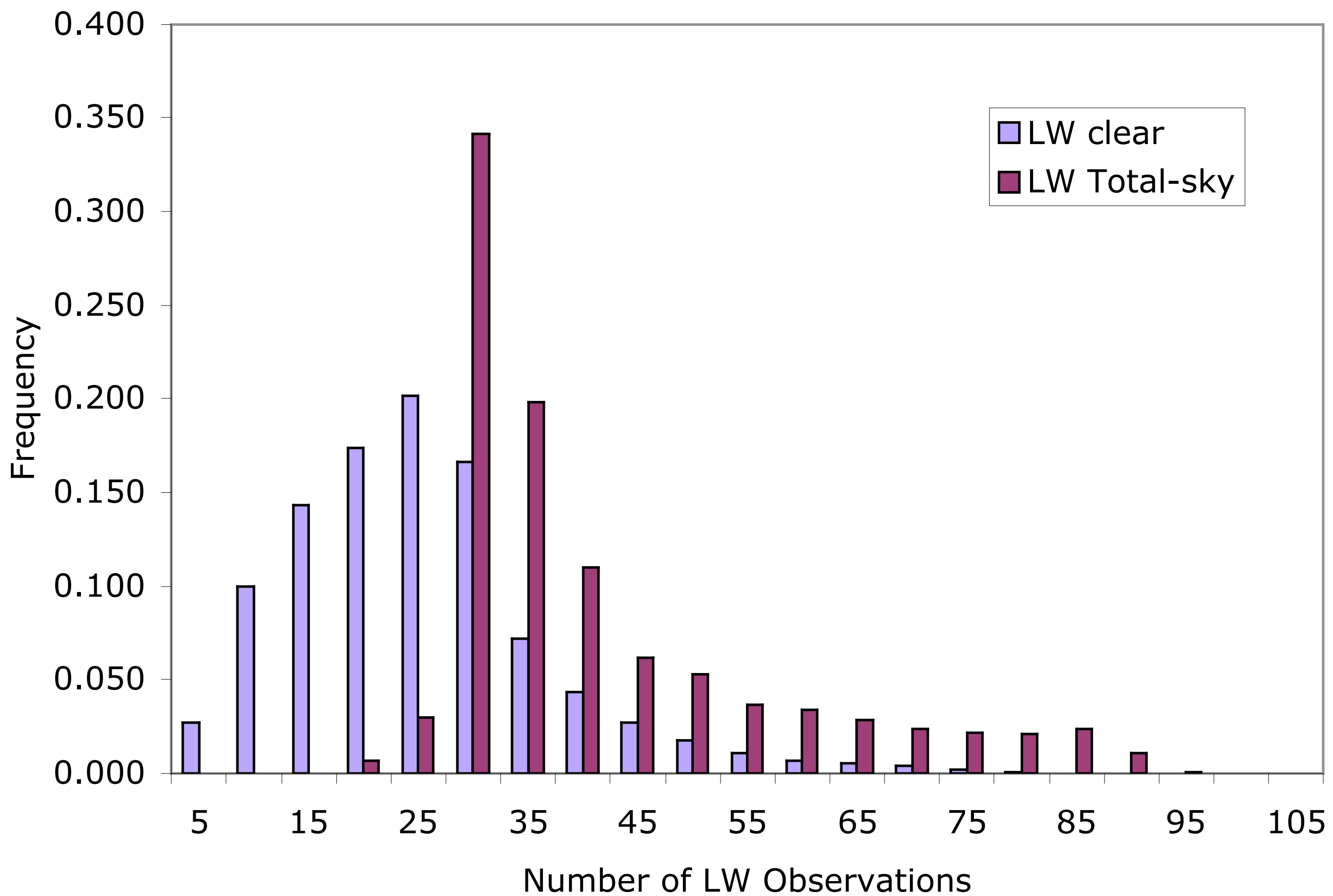

Figure 6. Comparison of LW clear-sky and total-sky sampling

Histogram of SRBAVG LW sampling for total-sky (red) and clear-sky (blue). Note that clear-sky sampling is greatly reduced relative to total-sky sampling.

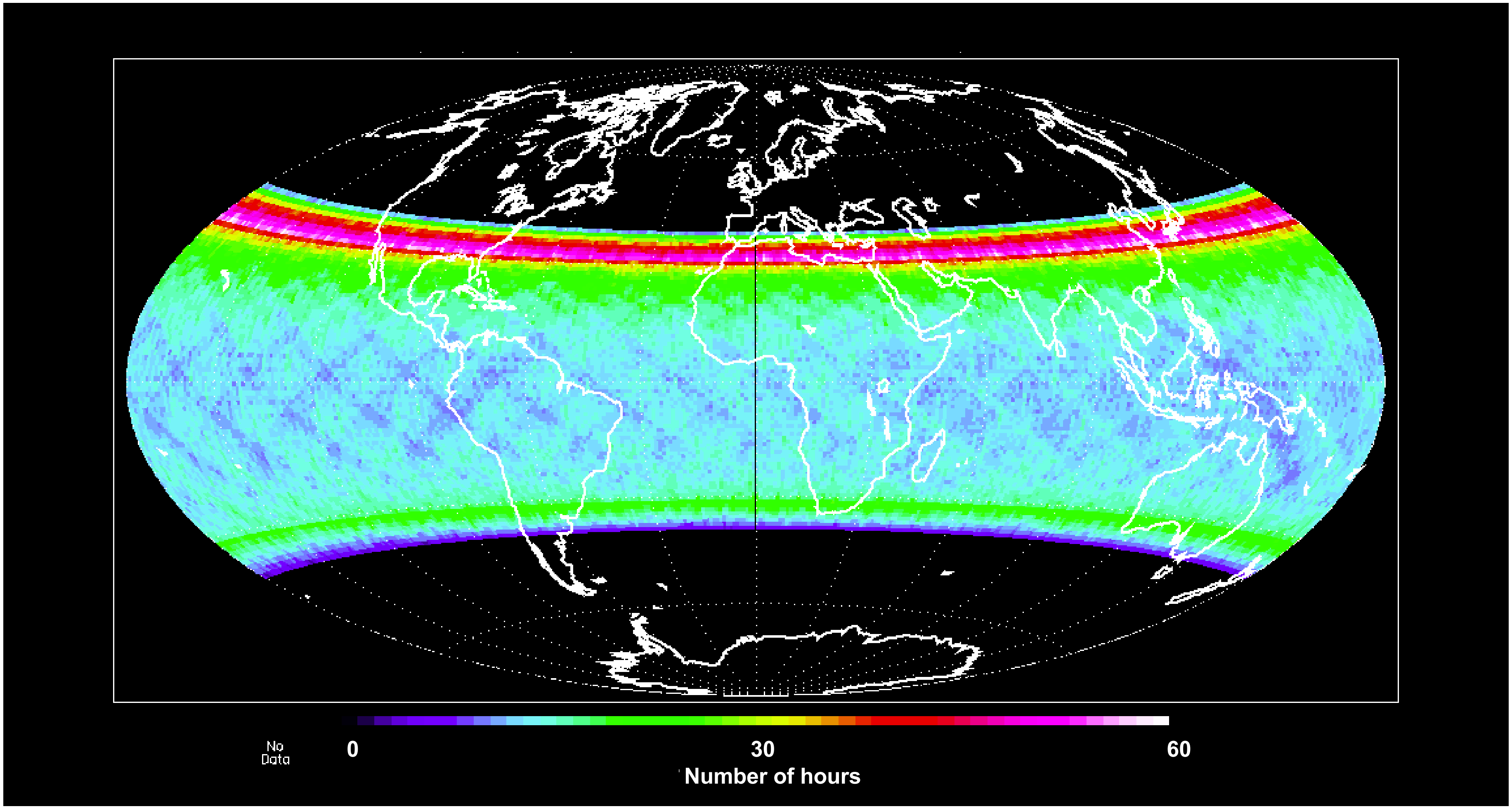

Figure 7. SRBAVG SW sampling.

The number hours during February 1998 that at least 1 SW observation was made in each 1° region by the CERES TRMM instrument. The asymmetry between northern and southern hemispheres is caused by sampling only 28 days of the 46-day TRMM precessionary cycle. This asymmetry will shift from month-to-month depending on which local hours are sampled. Note that the equatorial regions are observed fewer than 18 times/month. Regions poleward of 20° show increased sampling due to orbital overlap. However, the increased sampling does not greatly increase the the sampling of the diurnal cycle.

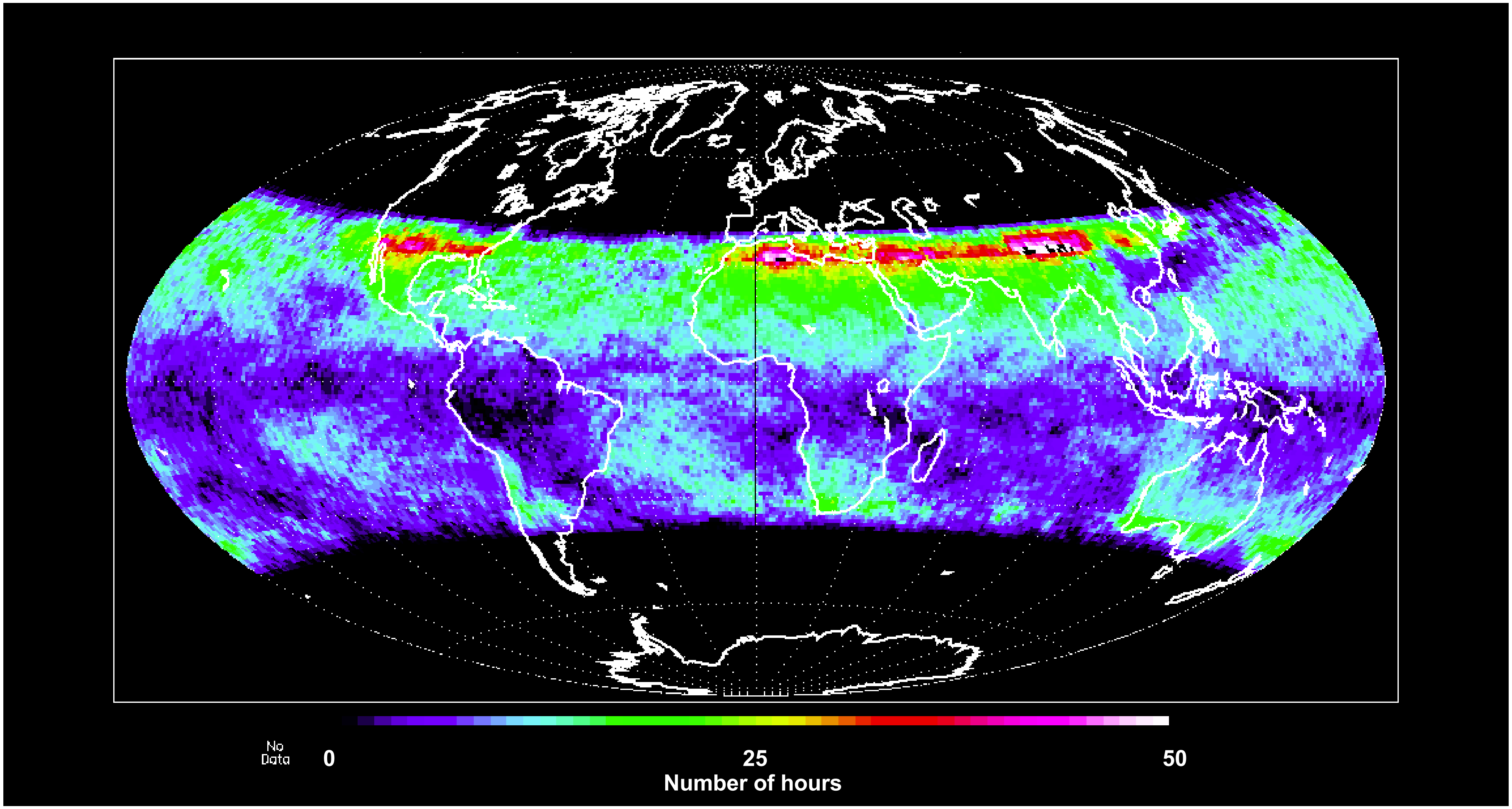

Figure 8. SRBAVG clear-sky SW sampling.

The number hours during February 1998 that at least 1 SW clear-sky observation was made in each 1° region by the CERES TRMM instrument. Areas shaded in black have no clear observations during the month. These are areas predominated by convection. The maxima near 30°N is due to the overall increased SW sampling in the Northern Hemisphere coupled with the proximity to desert regions.

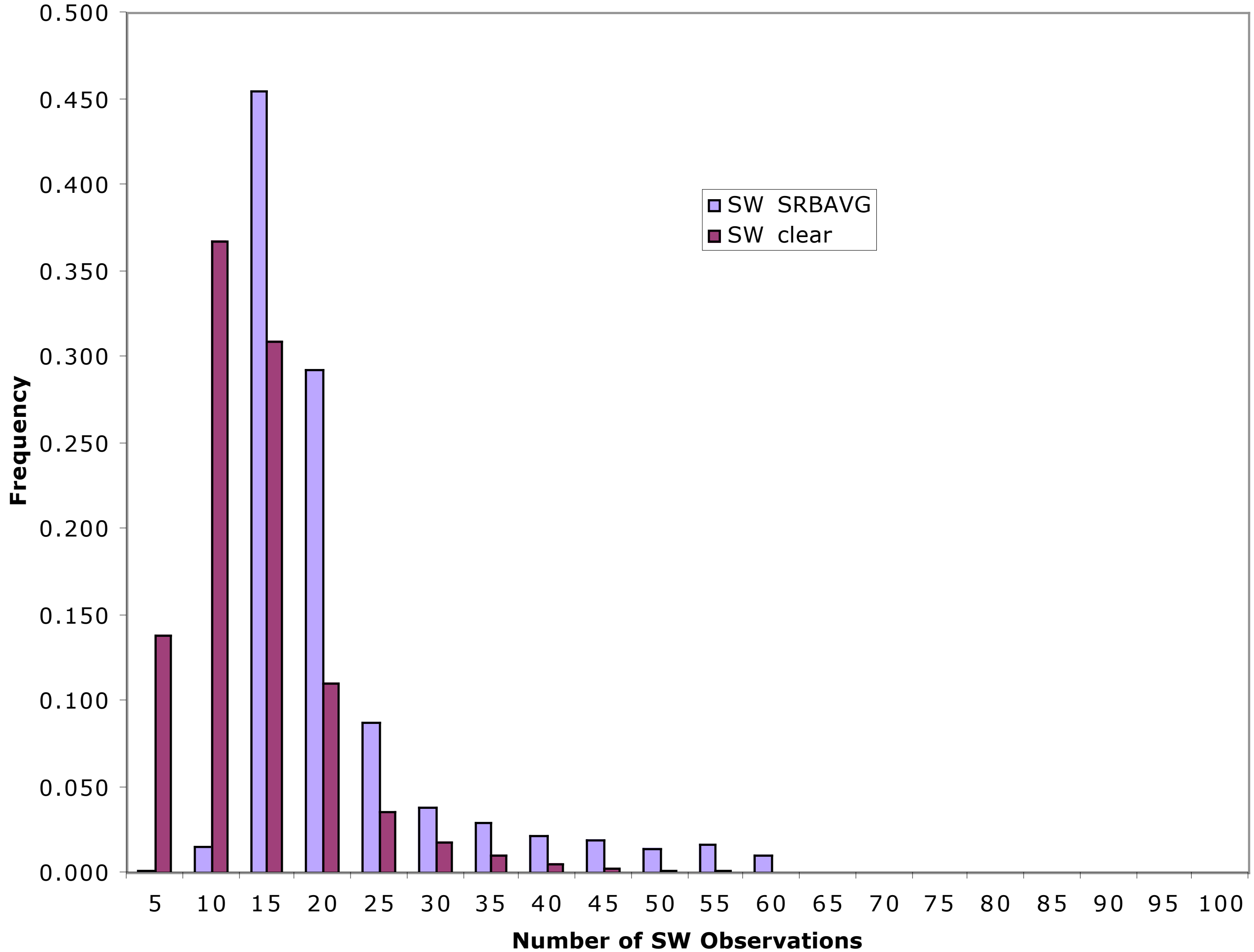

Figure 9. Comparison of SW clear-sky and total-sky sampling

Histogram of SRBAVG SW sampling for total-sky (blue) and clear-sky (red). Note that the clear-sky sampling is reduced relative to total-sky. This is not as great of an issue as it is for the clear-sky LW. Clear-sky SW changes over a month are generally less dramatic than LW. The main variability is due to changes in vegetation, soil moisture, aerosols, or snow cover.

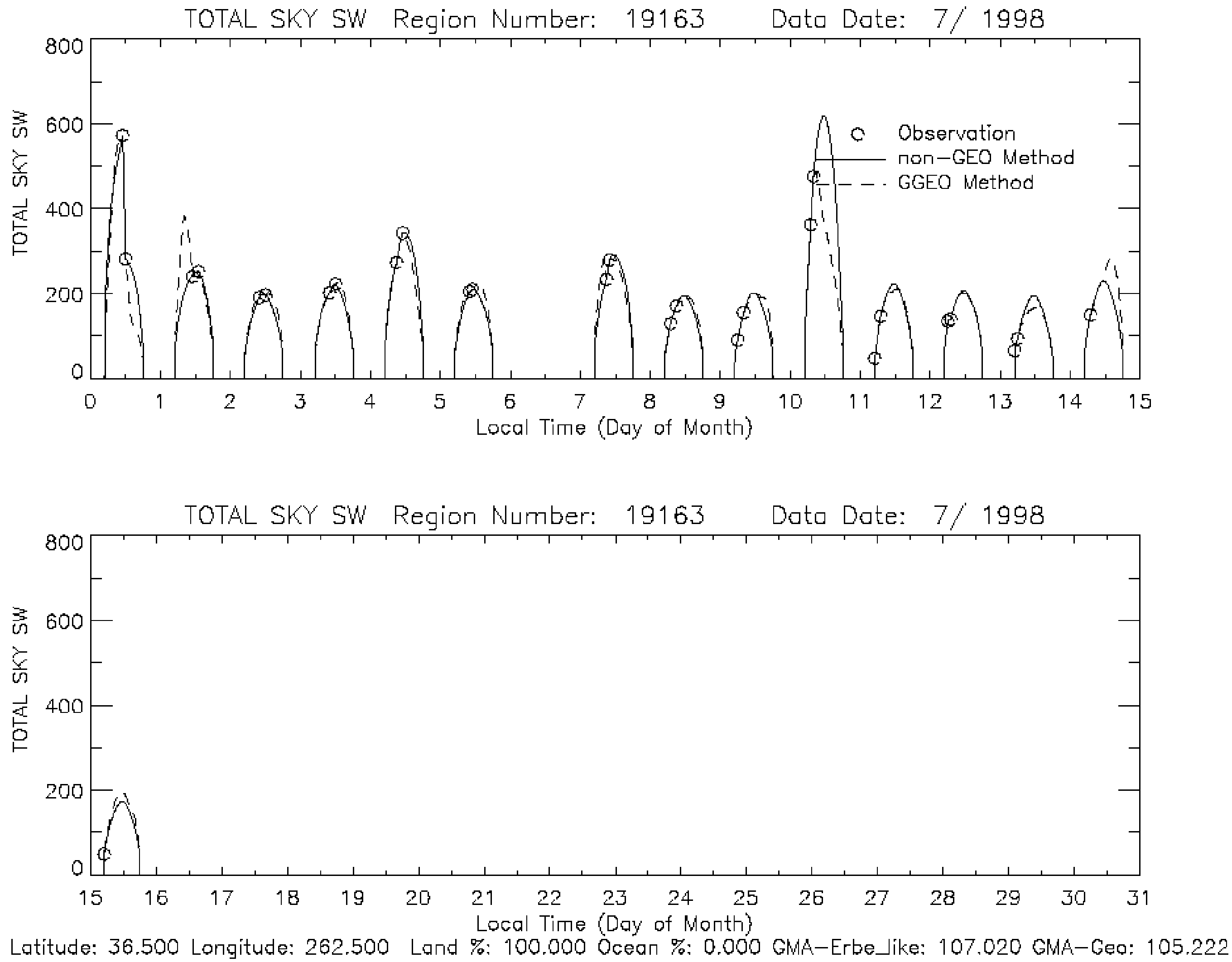

Figure 10. Example of high latitude total-sky SW time series

This is the time series of observed and interpolated SW flux over the ARM Southern Great Plains site (36.6°N, 97.49°W) from July 1998. The circles indicate times of CERES observations. Note that as the month progresses, the observation times get earlier each day. After July 15, the site is observed only at night. The solid lines indicate the non-GGEO interpolation and the dashed lines are the GGEO interpolation. Monthly means are calculated using only the days with at least one CERES observation.

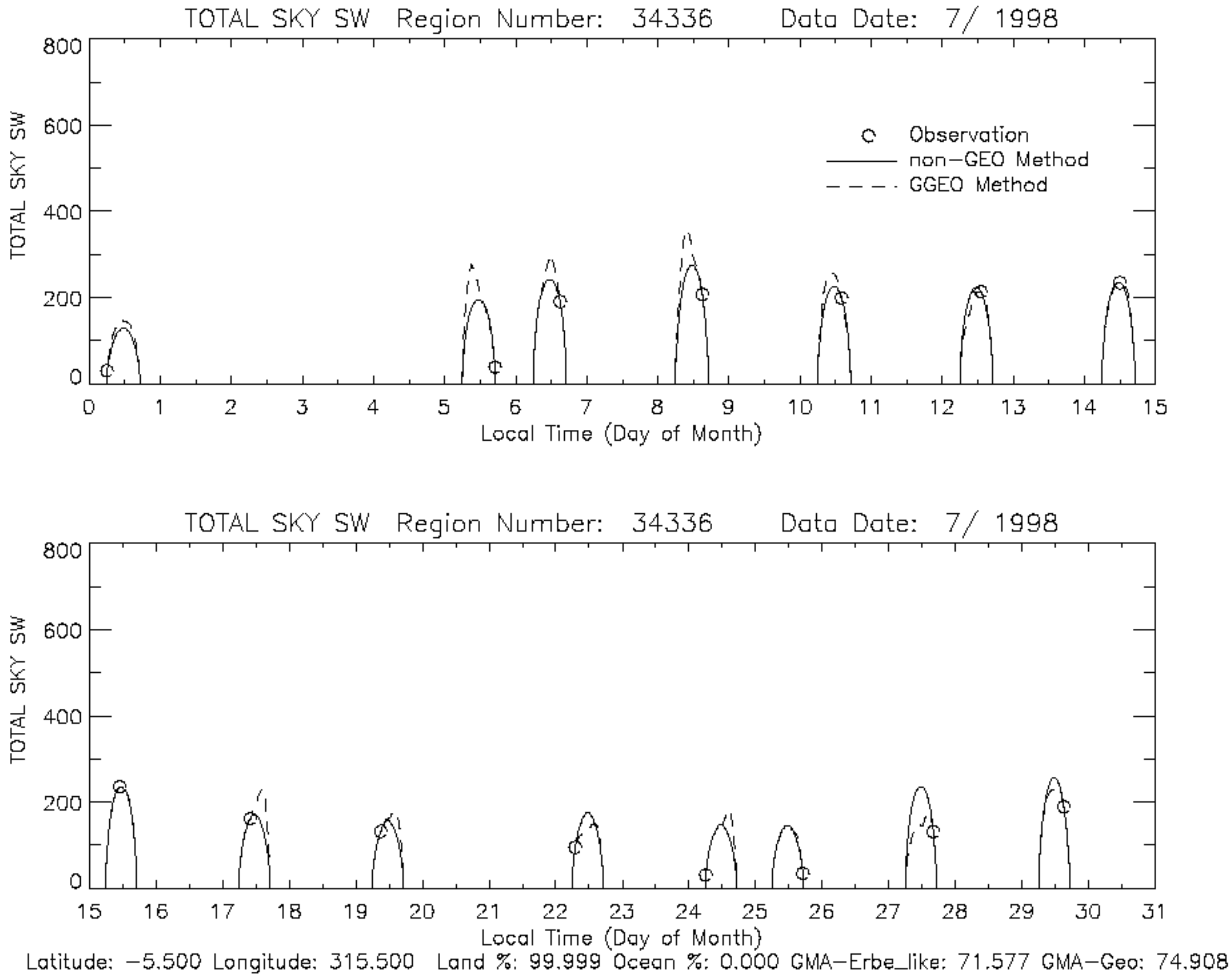

Figure 11. Example of equatorial total-sky SW time series

Same as Figure 10, but for an equatorial region in Brazil (5.5°S, 45.5°W). Note that the sampling is now spread throughout the month with sampling in half of the days. All local times are sampled in 23 days (1/2 of the precessionary cycle) since the region can be viewed during both the ascending and descending nodes. The 23-day cycle is evident - note that the same local time is observed on days 1 and 24.

Summary of CERES TRMM Monthly Mean Products

Sub-system	Product	Grid Size	VZ Limit	ADM	Scene ID
SS3	ERBE-Like (ES-4, ES-9)	2.5°	70°	Old ERBE	ERBE MLE
SS10	Non-GEO (SRBAVG)	1.0°	48°	CERES	VIRS
SS10	GEO (SRBAVG)	1.0°	48°	CERES	VIRS
SS8	Synoptic (AVG)	1.0°	48°	CERES	VIRS